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05 April 2021

Green Audit at VIPW

CII – Sohrabji Godrej Green Business Centre (CII – Godrej GBC) acknowledges with thanks the cooperation extended to the CII team for completing the Green audit at Vijaya Institute of Pharmaceutical Sciences for Women (VIPW).

The interactions and deliberations with VIPW team were exemplary and the whole exercise was thoroughly a rewarding experience for CII. We deeply appreciate the interest, enthusiasm, and commitment of VIPW team towards environmental sustainability.

We are sure that the recommendations presented in this report will be implemented and the VIPW team will further improve their environmental performance.

Kind regards,

Yours sincerely,

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Carbon footprint, energy audit, green audit and environmental audit

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Executive Summary

Built environment, especially an educational institution, has a considerable footprint on the environment. Impact on the environment due to energy consumption, water usage and waste generation in an educational institute is prominent. Therefore, there is an imminent need to reduce the overall environmental footprint of the institution.

As an Institution of higher learning, Vijaya Institute of Pharmaceutical Sciences for Women (VIPW) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

True to its belief, VIPW maintains an excellent landscaping in its campus. The whole campus is lush green, and trees are seen everywhere around the campus. CII congratulates the VIPW team for their wonderful efforts to create a truly green campus.

Based on the data submitted by VIPW team, following improvement opportunities have been identified in the campus in terms of landscaping:

- Implement ecosystem restoration by development of theme gardens in unused areas of the campus
- Develop green corridors and connection between existing areas in the campus
- Develop natural areas to encourage bird roosting and nesting in built-up areas
- Increase tree density and canopy cover in the built-up areas by planting more fruit yielding tree
- Conduct regular flora surveys for improving the existing data
- Develop strategies for regular monitoring & prevention of invasive plant species

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By addressing the improvement opportunities, the campus would be able to achieve the following benefits:

- Identifying & implementation of proper measure for conservation of endangered floral species in the campus
- Reduce the microclimate temperature of the campus by 1-2 degrees which is quite significant
- As many of the species have the capability to absorb contaminants in the air and therefore this would lead to better air quality in the campus
- This can evolve as an excellent educational campus for spreading awareness on biodiversity and benefit the nation at large

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Introduction

Urbanisation and its effect on loss of biodiversity

Urbanization causes biodiversity to decline. As cities grow vital habitat is destroyed or fragmented into patches not big enough to support complex ecological communities. In the city, species may become endangered or even locally extinct as natural areas are swallowed up by the urban jungle.

Ironically, it is urban growth that is often responsible for the introduction of non-native species, either accidentally or deliberately, for food, pets or for aesthetic reasons.

Documentation of Flora

Knowledge on biodiversity of any geographical region is of paramount importance for sustainable management and conservation plans. The foremost task in the conservation process is to prepare an inventory of species. It is necessary to have full knowledge regarding the habit, habitat, distribution and phenology of various plants for their proper conservation.

The documentation of flora will help in identifying, documenting and promoting the conservation of native flora in India. This in turn will help in promoting native species for landscapes as they suit the growing interest in "low-maintenance" gardening and landscaping.

Many species are vigorous & hard and can survive winter, cold and summer heat. These species, once established, can flourish without irrigation or fertilization and are resistant to most pests & diseases.

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Need for Documentation of Flora

The knowledge building on significance and importance of various flora existing around us is the need of the hour. Loss of the biodiversity is likely to result in loss of various other taxonomic groups.

Serve as a ready reckoner:

Most of the campuses have huge landscape with diverse floral species. Nevertheless, the availability of information on these species is minimal. Hence, the documentation of the species would serve as an educational material on the details of species existing within the campus

Public Visibility:

Despite having various Biodiversity initiatives in place within the campus most of the campuses lack the visibility of the measures taken in conservation. The study will create awareness & visibility of the campus on various conservation measures implemented to the occupants as well as to the visitors.

Also, the organization will gain visibility globally amongst its shareholders for the positive steps taken towards protecting biodiversity.

Conservation of species:

Due to urbanization most of the floral species are under tremendous pressure. The need of the hour is to conserve and protect these species. The study would help in identifying such species in the campus which need to be conserved.

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VIPW carbon sequestration through plantation

Carbon sequestration through plantation is one of the important steps towards achieving carbon neutrality. In carbon footprint calculation of VIPW, carbon sequestration through plantation is considered and due credit has been given.

No. of trees considered for carbon footprint calculation	:	50 trees
CO2 absorbed by a tree in one year	:	18 KG
Total CO2 sequestrated	:	50 trees x 18 KG of CO2 / year
	:	900 KGs of CO2

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Plantation & Maintenance techniques

Selection of species

- Native species like *Azadirachta indica* (Neem), *Pongamia pinnata* (Pongam tree), *Cassia fistula* (Indian shower tree), *Butea monosperma* (Flame of the forest) and also fruit bearing species like *Mangifera indica* (Mango), *Manilkara sapota* (Chikoo), *Syzygium cumini* (Jamun Tree), *Psidium guajva* (Guava), *Annona squamosal* (Custard apple), *Punica granatum* (Pomegranate), *Phyllanthus emblica* (Indian Gooseberry), *Citrus sinensis* (Sweet lime) and *Citrus limon* (Lime) to be selected for plantation
- Saplings of 2-3 ft height to be considered for plantation in public areas
- Plantation can be taken up as avenues (roadside plantation) and green belts (thick plantation in one area)
- Fruit plantation can be taken up in protected areas, institutions with large areas. Special care to be taken in maintenance since these plants also generate revenue

Digging of pits

Pits to be dug about one month prior to the plantation date and it should be exposed to sunlight. This will help in killing of harmful disease-causing bacteria and virus.

- In places of no availability of proper sunlight, dry trash to be filled in the pit and burnt.
- Pit size should be normally $2ft^3$ or $3ft^3$and in soils which are very hard $4ft^3$ or above to be dug.
- Further to the digging of pit, the bottom of the pit should be loosened up to 6-9 inches.
- While digging, we can observe different soil profiles. Topsoil will be soft and contains enough nutrients for nourishing the plant. The topsoil should be deposited on one end and hard soil on the other end. While filling the pit with soil, the topsoil only should be used. The topsoil from the non-plantation area around the pit to be collected and mixed with manure and used for filling of the pit.

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Transportation

- Visit to the nurseries and enquire about plant species like availability, size, age and girth prior to the plantation. Also, the size of the packet in which the plant is existing to be enquired.
- Ensure that the material is available in the nursery and allotted to pick up
- The saplings to be watered one or two days prior to the movement of plants to plantation area.
- The plants to be procured at least 15 days prior to plantation.
    - The saplings to be watered as soon as they reach the plantation area and regularly thereafter.
    - They should be kept in shade, non-windy & protected areas.
- The above said steps to be followed for movement of plants near to the pits within the plantation area.
- Enough water to be stored for watering the plants after plantation. Also, tools and manpower to be kept in place to ensure proper plantation of saplings
- If the sapling is bushy with many branches, then the branches are to be trimmed before plantation.

Plantation

- The poly bag around the root ball to be carefully cut with a knife / sickle / scissors without disturbing the roots
- Rope and stakes are to be kept ready to support the plant after plantation.
- Regular watering to be done to the plants followed by mulching (loosening of top 3 – 4 inches of soil)
- Mulching will help in conservation of moisture, aeration of roots and control of weeds.
- Note: At least 5% of extra plants to be procured for timely gap filling and to ensure 100% survival. Care to be taken for these plants like other plants.

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Recommendations for Enhancing Flora in Campus

1. **Implement Ecosystem Restoration**
   - Develop naturalised areas in the Open Area segments
     - Wastelands in the campus can be converted to a Park
   - 'Theme Gardens' can be developed in unused areas of the campus to increase proportion of natural area
2. **Enhance Ecosystem Protection**
   - Protect and maintain the existing Open Area segments
3. **Planting more fruit yielding trees**
   - Increase tree density and canopy cover in the built-up areas
4. **Increase number of Native Plants in the Landscape area**
   - Increase native plants to boost native biodiversity
     - Bees, butterflies and other insects
   - Healthy native plant growth will help in easy identification of invasive alien species
5. **Introduce more native species in Open Areas**
6. **Preventing/ Decreasing Invasive Alien Species Spread**
   - Identify potential threatening species in advance and implement quarantine measures
     - Mass Eradication techniques for larger spreads
   - Commitment to complete eradication
   - Manual Uprooting of small populations
7. **Develop natural areas to encourage bird roosting and nesting in built-up areas**

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8. **Introduce features to attract birds in the built-up areas**

   - Bird feeders
   - Water troughs/ Bird baths
   - Nesting material

9. **Improve measures for rainwater harvesting in paved and un-paved areas**

   - Open fields, parks, pavement landscapes, etc.
   - Develop outdoor parks in open areas

Conclusion

As seen in the carbon sequestration calculation, tree plantations lead to a tremendous reduction in net emissions of the campus. Therefore, VIPW needs to develop a roadmap to include tree plantation as a strategy to reduce overall carbon emissions of the campus.

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05 April 2021

Carbon footprint and Energy audit at VIPW

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Kind regards,

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Executive Summary

The growth of countries across the world is leading to increased consumption of natural resources. There is an urgent need to establish environmental sustainability in every activity we do. In a modern economy, environmental sustainability will play a critical role in the very existence of an organization.

An educational institution is no different. Built environment, especially an educational institution, has a considerable footprint on the environment. Impact on the environment due to energy consumption, water usage and waste generation in an educational institute is prominent. Therefore, there is an imminent need to reduce the overall environmental footprint of the institution.

As an Institution of higher learning, Vijaya Institute Of Pharmaceutical Sciences For Women (VIPW) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

True to its belief, VIPW has implemented few projects such as installation of biogas plant for generating biogas from canteen waste and LED lamps for lighting. CII team congratulates VIPW team for their efforts.

Keeping VIPW's work in energy efficiency, CII recommends the following to be taken by the competent team at VIPW:

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Work towards achieving carbon neutrality: INDC puts emphasis on creating an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030. Presently, VIPW's net carbon emission is 498.6 MT CO2e. VIPW should focus on energy efficiency, renewable energy and carbon sequestration as tools that will enable them to offset the present carbon emissions and achieve carbon neutrality.

Installation of solar rooftop: Renewable energy plays a very important role in improving the environmental footprint of an organization. By increasing the share of renewable energy in VIPW's energy portfolio, the overall carbon footprint of the college can be reduced. Presently, based on the roof area available at VIPW campus, 25 kW of solar rooftop can be installed. This will result in generation of 26500 units of electricity annually ultimately resulting in 45% of renewable energy share in VIPW portfolio. Renewable share will also reduce the 29.93 MT CO2e.

Installation of additional biogas plant: VIPW has already installed a biogas plant for generating .ogas from canteen waste. Presently, sewage water is being let out to the drain without treatment. An opportunity exists to generate biogas from the untreated sewage water and use the generated biogas to substitute LPG used in the college. In 2019, VIPW had used 2 MT of LPG. By generating biogas from sewage water, about 0.93 MT of LPG can be replaced which will result in carbon savings of 2.79 MT CO2e.

Improve energy efficiency of the college: It is recommended to adopt latest energy efficient technologies for reducing energy consumption in fans, lighting, and air conditioners. We recommend the following projects to be implemented at the earliest:

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- Replace conventional 60W ceiling fans with energy efficient BLDC fans of 30W
- Replace conventional 36W tube lights with LED lights of 15W
- Install air conditioners energy savers to save energy in spilt air conditioners

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Carbon Footprint and Energy Audit

Vijaya Institute of Pharmaceutical Sciences for Women (VIPW) and CII are working together to identify opportunities for improvement in energy efficiency and carbon reduction. This report highlights all the potential proposals for improvement through the audit and analysis of the data provided by VIPW for lighting, air conditioning, ceiling fans and biogas potential.

The report also details the carbon emissions from college operation. For carbon emissions, scope 1 and scope 2 emissions are calculated from the data submitted by VIPW. The report emphasizes on the GHG emission reduction potential possible through reduction in power consumption.

Submission of Documents

Carbon footprint and energy audit at VIPW was carried out with the help data submitted by VIPW team. VIPW team was responsible for collecting all the necessary data and submitting the relevant documents to CII for the study.

Carbon Footprint and Energy Audit

Data submitted and collected during the visit was used to calculate carbon footprint of the campus and assess energy consumption and finally provide necessary recommendation for environmental improvement.

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Note

Carbon footprint and energy audit are based on the data provided by VIPW team and discussions CII team had with VIPW team. The scope of the study does not include the exclusive verification of various regulatory requirements related to environmental sustainability.

CII has the right to recall the study, if it finds (a) major violation in meeting the environmental regulatory requirements by the location and (b) occurrence of major accidents, leading to significant damage to ecology and environment.

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OPPORTUNITIES FOR IMPROVEMENT

As a part of the overall environmental improvement study at VIPW, carbon footprint calculations were also carried out. The objective of calculating the carbon footprint of the campus is find the present level of emissions from campus operation and what initiatives that the VIPW can take to offset the emissions. By offsetting the emissions, the college can become carbon neutral in the future by adopting energy efficient processes, increase in renewable energy share and tree plantation.

Carbon footprint calculations:

To help delineate direct and indirect emission sources, improve transparency, and provide utility for different types of organizations and different types of climate policies and business goals, three "scopes" (scope 1, scope 2, and scope 3) are defined for GHG accounting and reporting purposes.

For calculating carbon footprint of the campus, Scope 1 & Scope 2 emissions are being considered. Since day scholars use college provided transportation and hostelers stay in campus, Scope 1 and Scope 2 are the highest contributor to overall emissions. For this reason, Scope 3 is not being calculated.

Scope 1: Direct GHG Emissions

Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled DG sets, canteen, vehicles, etc.; emissions from chemical production in owned or controlled process equipment. Direct CO2 emissions from the combustion of biomass shall not be included in scope 1 but reported separately.

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VIPW Scope 1 emissions for 2019:

Sources of Scope 1 emissions in VIPW:

1) Diesel used for DG Set

2) Diesel used for college owned transportation

3) LPG used for canteen, hostel, and lab

SN	Fuel Type	Description	Activity Data	Units	Emission Factor	Units	CO2 eq. Emissions	Units
1	Diesel	DG Set	5.40	KL	2.64	T CO2/KL	14.26	Tons
2	LPG	LPG for canteen and hostel	2.05	MT	2.98	T CO2/T	6.11	Tons
3	Diesel	College bus	11.40	KL	2.64	T CO2/KL	30.10	Tons
4	LPG	LPG for Lab	0.08	MT	2.98	T CO2/T	0.23	Tons

Total Scope 1 emissions of VIPW : 50.70 Tons (for year 2019)

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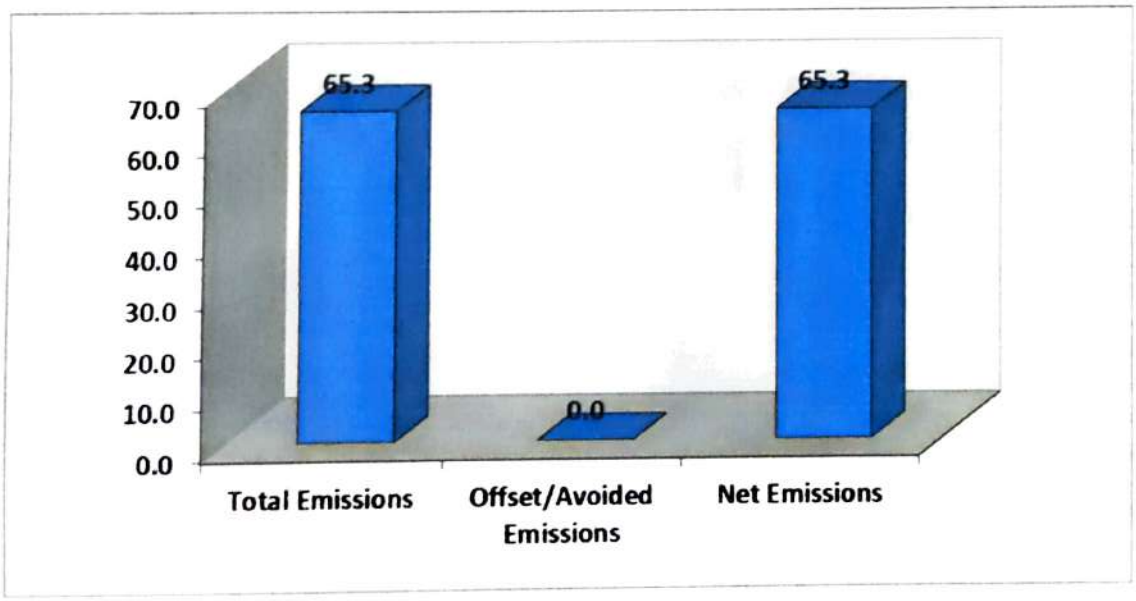
Scope 2: Electricity Indirect GHG Emissions

Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by a company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

VIPW Scope 2 emissions for 2019:

Electricity purchased from grid : 79683 units



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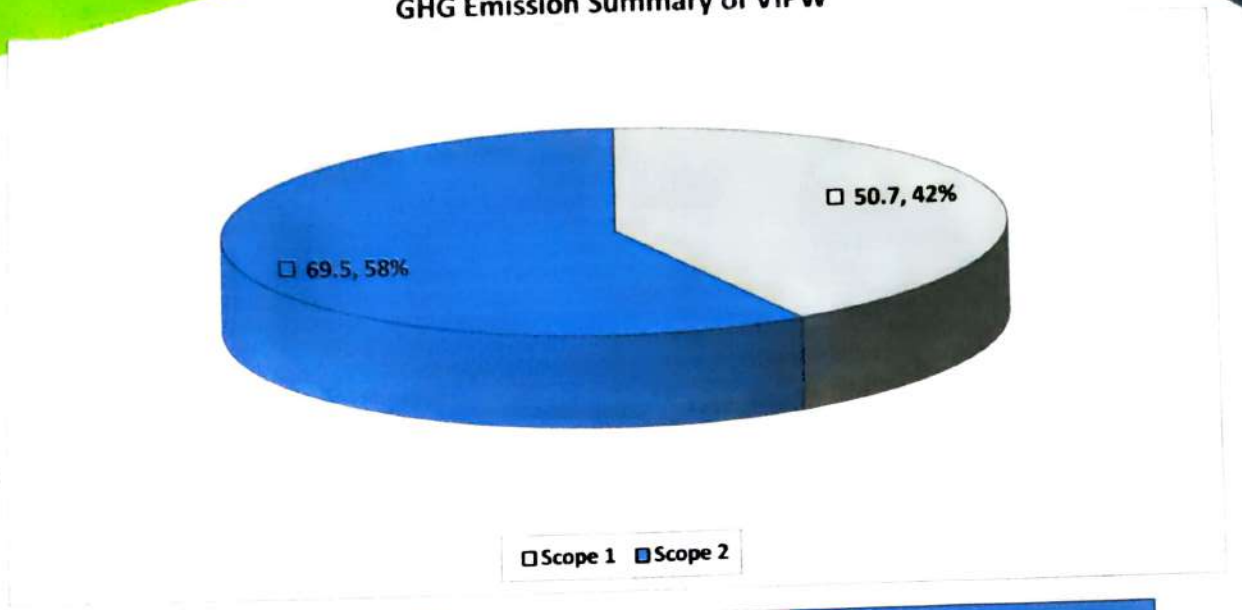
GHG Emission Summary of VIPW



Scope 1	50.7	MT CO2 eq.
Scope 2	65.3	MT CO2 eq.
Total	116.0	MT CO2 eq.

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Develop a roadmap to increase contribution of renewable energy in the overall energy consumption

To have a continued focus on increasing renewable energy utilization to 100% which will also lead to reduction in GHG emissions, it is suggested to develop a detailed roadmap on RE utilization. The roadmap should broadly feature the following aspects -

- Renewable energy potential of VIPW and the maximum offset that can be achieved at VIPW
- Percentage substitution with renewable energy that VIPW wants to achieve in a specified timeframe
- Key tasks that needs to be executed to achieve the renewable energy target
- Specific financial break up for each of the projects highlighting the amount required, available and the utilization status as on date
- A regular review mechanism to ensure progress along the lines of the roadmap should be framed
- The roadmap should also highlight important milestones/key tasks, anticipated bottlenecks & proposed

Renewable energy roadmap should be used as a base to frame GHG emissions reduction target

It is suggested to use the developed renewable energy roadmap to correlate the GHG reduction that each of the renewable energy project will achieve. This approach will provide a base to set targets for reduction in GHG emissions. The action plan for renewable energy will shoulder the action plan for GHG emissions reduction and work towards achieving carbon neutrality.

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Explore the option of other onsite and offsite renewable energy projects

The renewable energy field has been witnessing many private investors due its increased market demand and attractive policies in many states. There are Renewable Energy Independent Power Producers (RE IPPs) who have installed RE based power plants like wind, small hydro and solar PV. GOC can consider having a long-term power purchase agreement with these RE IPPs in purchasing fixed quantity of power for a period of 5 to 10 years.

Evolve a system to monitor the implementation of various GHG mitigation opportunities

VIPW has an action plan to reduce its GHG emissions. VIPW should also evolve a system to monitor the implementation of various GHG mitigation opportunities. It is recommended to use a Gantt chart to mark out the action plan for the activities and track its implementation. Gantt chart will serve as an excellent way to instantly monitor and comprehend all different tasks in one place which would ease tracking of implementation.

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Install 25 kWp of Solar rooftop in VIPW campus

VIPW energy portfolio does not include any renewable energy component. Renewable energy is one of the important steps to be taken up by the college to reduce their overall carbon footprint. Based on the details provided by VIPW team, the roof area has the capacity to hold 25 kW of solar panel. 25 kWp of solar rooftop can generate **36,500** units of electricity per year. This will account to **45%** of total energy consumption of the campus.

Additionally, 25 kWp of solar rooftop can offset **29.93 MT CO2e** per annum. This accounts for 25% of overall carbon emissions from the campus.

RESCO model for solar rooftop installation:

A Renewable Energy Service Company (RESCO) is an ESCO Energy service company which provides energy to the consumers from renewable energy sources. RESCO or BOOT model is about pay as you consume the electricity.

- Solar Power Plant is owned by the RESCO or Energy Company
- Customer must sign a Power purchase Agreement (PPA) with actual investor at mutually agreed tariff and tenure
- Customer only pays for electricity consumed
- RESCO developer is responsible for its annual operations & maintenance (O&M)
- The RESCO gets the benefit by selling the surplus power generated to the DISCOM

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Source: www.bluebirdsolar.com

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Install additional biogas plant at VIPW campus

Presently, sewage water is being let out to the drain without treatment. An opportunity exists to generate biogas from the untreated sewage water and use the generated biogas to substitute LPG used in the college.

VIPW had used 2 MT of LPG. By generating biogas from sewage water, about 0.93 MT of LPG can be reduced which will result in carbon savings of 2.79 MT CO2e.

Biogas Production Potential of Wastewater

The sewage water is a useful waster as 1% of it in any quantity is a sludge which when subjected to anaerobic digestion will produce biogas. Wastewater is the effluent from household, commercial establishments and institutions, hospitals, industries and so on. Sewage water source contains large amount of organic material which can be efficiently recovered in as sludge which and when subjected to anaerobic digestion, the sludge produces methane gas (biogas).

Biogas is a mixture of gases containing 50-75% Methane, and 25-50%Carbon dioxide while 0-10% Nitrogen, 0-3% Hydrogen disulphide and 0-2% Hydrogen may be present as impurities which is produced by anaerobic digestion of organic material i.e. a sequential enzymatic breakdown of biodegradable organic material (Biomass) in the absence of oxygen. The process is usually carried out in a digester tank known as biodigester. Biogas is an important energy source used as cooking gas, to generate electricity, etc. thus producing biogas from wastewater is an efficient and sustainable waste management and renewable energy technique. One of the major environmental problems of the world today is waste management and wastewater constitutes a huge environmental problem to the society thus the need for wastewater treatment to recover and also recycle the recovered water for usage.

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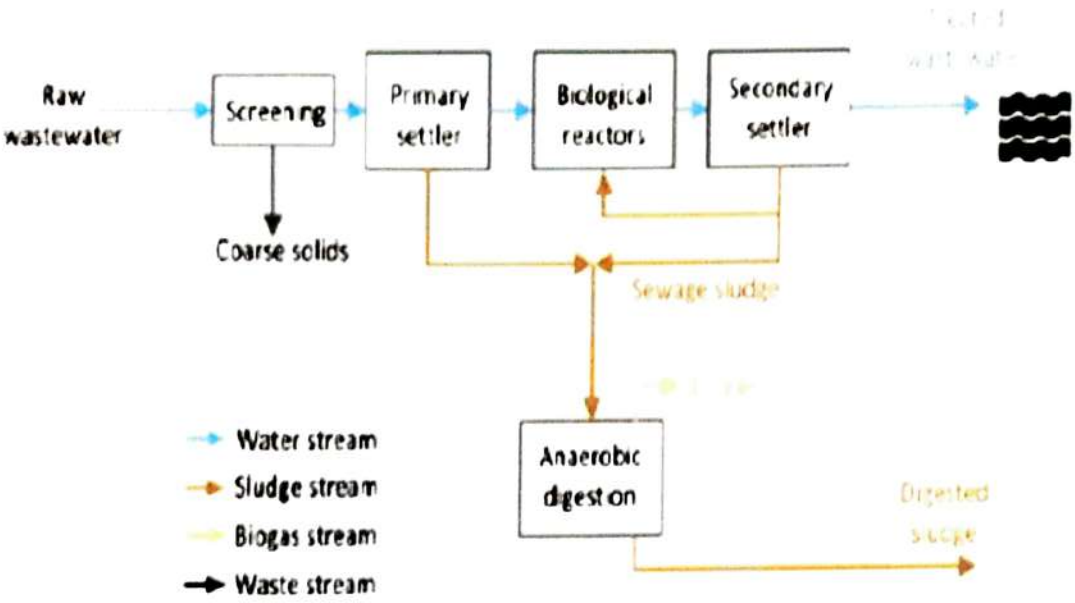

The physical process: this is the mechanical treatment of the water that involves removal of debris from the raw wastewater right from the point it enters the plant. The screening and primary settling of(ebris. Wastewater enters the treatment plant through the inlet chamber from where it is channeled to the coarse screen that removes solid waste.

The biological process: this involve the biotreatment of the sewage in the bioreactors. It is the heart of the treatment plant where a biological process takes place. The bioreactors of a treatment plant are usually large tanks consisting of several mammoth rotors and submersible mixers. While the rotor introduces atmospheric oxygen into the sewage, the submersible mixers keep the biomass in suspension thus several reactions takes place in the bioreactors.

N Muthusezhiyan
Principal Counsellor

Confederation of Indian Industry
125 Years: 1895-2020
CII – Sohrabji Godrej Green Business Centre
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Ranga Reddy Dist., Hyderabad - 500 084, INDIA
Tel: +91-40-44185111 Fax: 91-40-44185189
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Website: www.greenbusinesscentre.com

05 April 2021

Environmental Audit at VIPW

CII – Sohrabji Godrej Green Business Centre (CII – Godrej GBC) acknowledges with thanks the cooperation extended to the CII team for completing the Environmental audit at Vijaya Institute of Pharmaceutical Sciences for Women (VIPW).

The interactions and deliberations with VIPW team were exemplary and the whole exercise was thoroughly a rewarding experience for CII. We deeply appreciate the interest, enthusiasm, and commitment of VIPW team towards environmental sustainability.

We are sure that the recommendations presented in this report will be implemented and the VIPW team will further improve their environmental performance.

Kind regards,

Yours sincerely,

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N Muthusezhiyan
Principal Counsellor

Confederation of Indian Industry

125 Years - Since 1895

2017

Vijaya Institute of Pharmaceutical Sciences for Women

Environmental Audit, Water Conservation and Waste Management

Confederation of Indian Industry
125 Years: 1895-2020
CII – Sohrabji Godrej Green Business Centre
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Acknowledgement

N Muthusezhiyan
Principal Counsellor

05 April 2021

Carbon footprint, energy audit, green audit and environmental audit

CII – Sohrabji Godrej Green Business Centre (CII – Godrej GBC) acknowledges with thanks the cooperation extended to the CII team for completing the study at Vijaya Institute of Pharmaceutical Sciences for Women (VIPW).

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Executive Summary

The growth of countries across the world is leading to increased consumption of natural resources. There is an urgent need to establish environmental sustainability in every activity we do. In a modern economy, environmental sustainability will play a critical role in the very existence of an organization.

Built environment, especially an educational institution, has a considerable footprint on the environment. Impact on the environment due to energy consumption, water usage and waste generation in an educational institute is prominent. Therefore, there is an imminent need to reduce the overall environmental footprint of the institution.

As an Institution of higher learning, Vijaya Institute of Pharmaceutical Sciences for Women (VIPW) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

True to its belief, VIPW has implemented rainwater harvesting in the campus. Continuing with rainwater harvesting, the college can also investigate the following recommendations:

- **Attain water positive status:** VIPW should focus on capturing the harvested rainwater to substitute freshwater consumption, work on sustainable groundwater beyond the fence and create a framework towards attaining water positive status over a period. Presently, VIPW is consuming nearly 30 KL of fresh water per day. Since metering is not available, the water consumption is calculated rather than measure value.

The first step is to increase the water conservation activities in the campus to reduce water consumption at source. The next step is to increase the rainwater harvesting capacity to completely offset the freshwater requirements of the plant. VIPW can also explore adopting lakes, desilting of ponds and restoration of water bodies in localities surrounding the campus. Water getting harvested in those structures can offset the freshwater consumption of the college.

- **Install water efficient fixtures**: Best way to conserve water is at the source. Therefore, VIPW will have to install water efficient fixtures to reduce water consumption. Some of the water efficient fixtures are:
    - Waterless urinals
    - Electronic taps (e-taps)
    - Electronic flush urinals (e-flush)
    - Foam taps
    - Spring loaded push taps
    - Low flush cistern
- **Install sewage treatment plant / rootzone treatment:** VIPW uses more than 30 KL of fresh water per day. Considering that 10 KL of water is being let to drain without treatment, good opportunity exists to reduce freshwater consumption by treating the sewage water and using the recycled water for gardening and flushing application. Install biogas plant and phytoremediation in series to recycle water and reduce freshwater consumption.
- **Install water flow meters**: Water flow meters are vital in understating the water consumption patterns of the campus. Presently, the water consumption is calculated rather than being measured. Water flow meters gives an accurate status if water consumption in the campus and from the water consumption values, the roadmap for water conservation activities can be prepared.

- **Install level sensors for main water tank**: Main source of water for the campus are two borewells. The borewells pump water to the main water tank. The pump supplying water to the main tank is switched on/off manually based on the tank level. In the present operation, there is a chance that the overflow of water may occur because of human interference and may lead to water and energy wastage. Therefore, it is recommended to install water level sensors for the tank operate the pumps automatically based on the level of water in the tank.
- **Segregate waste at source**: VIPW has provided bins for waste collection. The effectiveness of the system is still not up to standards. Therefore, VIPW must embark on awareness creation methods to increase the effectiveness of collection and provide more bins for proper waste segregation.
- **Maintenance of waste management yard**: Currently, the waste management yard is not being maintained up to standards. The waste management yard is to be maintained just like raw materials storage room. Waste is nothing but a resource in wrong place. Therefore, by maintaining the waste management yard, quality of wastes can be maintained.

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Environmental Audit

VIPW and CII are working together to identify opportunities for improvement in water management, and waste management. This report highlights all the potential proposals for improvement through the audit and analysis of the data provided by VIPW for water consumption and waste management. The report details the process conducted for the analysis such as on ground surveys performed for listing the type of water consumers with consumption per year, types of waste generated and disposal mechanisms.

Submission of Documents

Environmental audit at VIPW was carried out with the help data submitted by VIPW team. VIPW team was responsible for collecting all the necessary data and submitting the relevant documents to CII for the study.

Preliminary Study

After the receipt of documents, a desktop review of the data for quality check, followed by preliminary study was carried out by CII. In case of discrepancy/inadequacy/non-clarity of data, CII - Godrej GBC team got in touch with the VIPW team for clarification/additional information.

Environmental Audit

Data submitted and collected during the visit was used to assess the water and waste management practices of the campus and finally provide necessary recommendation for environmental improvement.

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Note

Environmental audit is based on the data provided by VIPW team. The scope of the study does not include the exclusive verification of various regulatory requirements related to environmental sustainability.

CII has the right to recall the study, if it finds (a) major violation in meeting the environmental regulatory requirements by the location and (b) occurrence of major accidents, leading to significant damage to ecology and environment.

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Water Conservation

To achieve a water positive status by continuous reduction of freshwater consumption should be the ultimate focus of VIPW. Increased and focused attention should be given to attain water sustainability in future by inculcating the discipline of water conservation.

Fresh water consumption of VIPW	:	30 KL per day (KLD) (Calculated)
Source of water	:	Borewells
Number of water meters installed	:	NIL
Rainwater harvesting	:	carried out for roof area

According to the report, 'Water in India: Situation & Prospects', India is the largest consumer of groundwater in the world with an estimated usage of 230 km3 per year. Approximately 60 per cent of the demand from agriculture and irrigation, and about 80 per cent of the domestic water demand, is met through groundwater. As per the Department of Drinking Water and Sanitation nearly 90 per cent of the rural water supply is from groundwater sources. This has led to an increased pressure on aquifers and the resulting hydrological imbalance.

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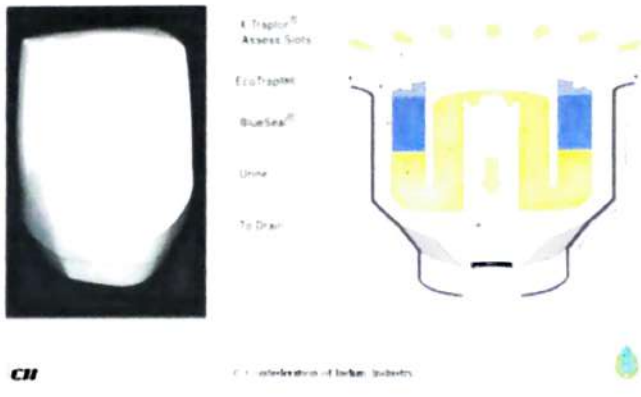
Recommendations for water conservation:

1) Waterless urinals: Waterless urinals look like regular urinals without a pipe for water intake. Men use them normally, but the urinals don't flush. Instead, they drain by gravity. Their outflow pipes connect to a building's conventional plumbing system. In other words, unlike a composting toilet, which leaves you to deal with your waste, these urinals send the urine to a water treatment plant.

Waterless Urinal

Waterless Urinal



a. Urine flows into the drain insert of the EcoTrap.
b. Inside of the EcoTrap the urine moves through a floating layer of proprietary immiscible BlueSeal liquid, which creates a barrier, preventing sewer gases and urine odors from entering the restroom area.
c. The urine below the BlueSeal barrier overspills into the central tube and travels down into the drain line.
d. Approximately 1500 sanitary uses are possible with just 3 ounces of BlueSeal. When the BlueSeal liquid is gone, it is simply replenished. This only takes about 20 seconds to perform and the EcoTrap is not touched.

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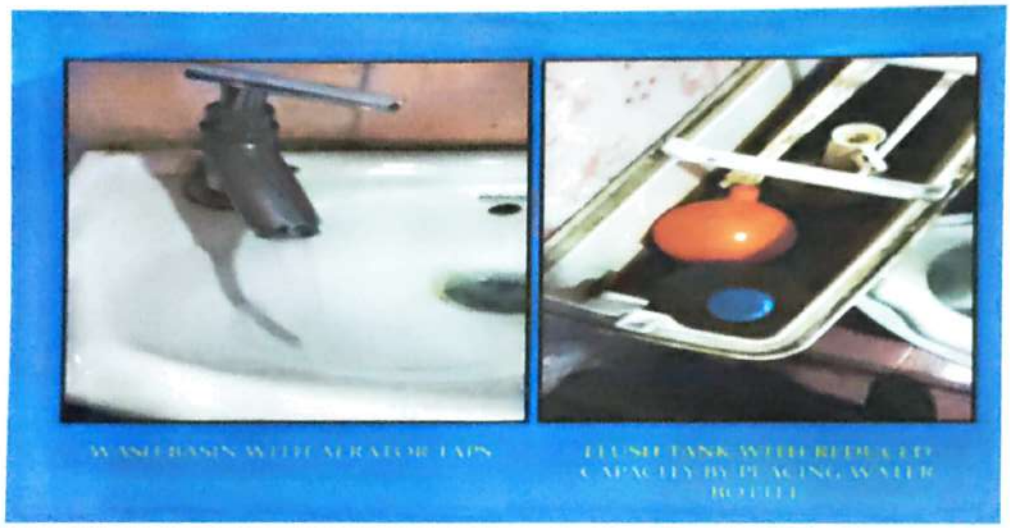
e. Urine sediments are retained within the EcoTrap. Replacement is easy and need only be done 2 to 4 times per year depending on traffic to the urinal. As tool called the X-Traptor must be used to remove the EcoTrap. The use of the special tool helps to minimize vandalism. The entire process of replacement only takes 3 to 4 minutes.

2) Volume reduction in flush tanks: One simple method is to add a one-liter equivalent water bottle in the flush tank thereby reducing its consumption majorly. One-liter savings in the tank will help to save approximately by 20% and doesn't require any investment.



3) Rainwater harvesting: Water harvesting or more precisely rainwater harvesting is the technique of collection and storage of rainwater at surface or in subsurface aquifer, before it is lost as surface run off. In artificial recharge, the ground water reservoirs are recharged at a rate higher than natural conditions of replenishment.

According to a report by the Central Groundwater Board published in 2007, the selection of a suitable technique for artificial recharge of ground water depends on various factors. They include:

a) Quantum of non-committed surface runoff available

b) Rainfall pattern

c) Land use and vegetation

c) Topography and terrain profile

d) Soil type and soil depth

e) Thickness of weathered / granular zones

f) Hydrological and hydrogeological characteristics

g) Socio-economic conditions and infrastructural facilities available

h) Environmental and ecological impacts of artificial recharge scheme proposed

Rainwater Harvesting Techniques in Urban Area

In urban areas rainwater is available from roof tops of buildings, paved and unpaved areas. This water could be stored and used to replace freshwater as well as used for recharging the aquifer.

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a) Quantum of non-committed surface runoff available

b) Rainfall pattern

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4) Display water balance/conservation status at entrance of all blocks for overall involvement of all students & staff

It is suggested to display specific water consumption numbers in terms of domestic use at the entrance of each blocks to create awareness among all students and stakeholders visiting the facility. This daily/continuous awareness creation will ultimately help in reduction of water consumption by students.

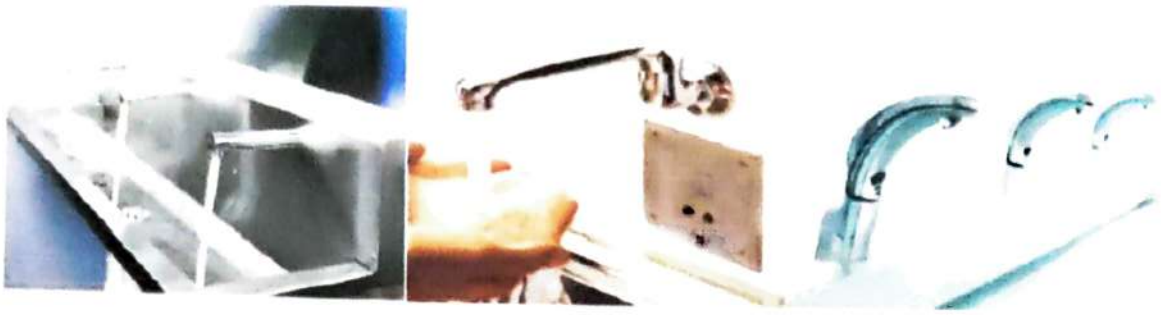
Water Saving Gadgets

It is suggested to display specific water consumption numbers in terms of domestic use at the entrance of each blocks to create awareness among all students and stakeholders visiting the facility. This

Electronic Taps (e-taps)

The latest trend in industries is to install electronic taps (e-taps). The advantages of using e-taps are as mentioned below:

- Unlike conventional taps, there is no twisting or turning in e-taps. They have a sensor, which cuts off water supply completely when not in use. This helps in saving up to 70% water during hand wash.
- E-taps enable hands free operation. No fear of cross contamination or contact with germs. E taps score very high on hygiene. It is the most ideal choice for multipurpose and multi-user washrooms.
- E-taps can work efficiently up to raw water TDS of 1,800 ppm.
- The touch free electronic taps, available in AC and DC models consume minimal power only. The AC model has an efficient battery back-up, while the DC model runs on just 4 alkaline batteries.



Operation of Electronic Taps

This has been successfully implemented in several hotels & restaurants. Of late, several industries have also started implementing this proposal. Thus, there is a good potential to optimize the freshwater consumption by replacing the existing taps with e-taps.

Electronic flush (e-flush) urinals

The latest trend in industries is to install e-flush urinals. The advantages of using e-flush urinals are as mentioned below:

- E-flush urinals are fitted with a sensor, which senses the usage and flush with water for few seconds after use. This helps in saving 70% water during urinal flush.
- E-flush urinals enable hands-free operation and score very high on hygiene. It is the most ideal choice for multipurpose and multi-user washrooms.
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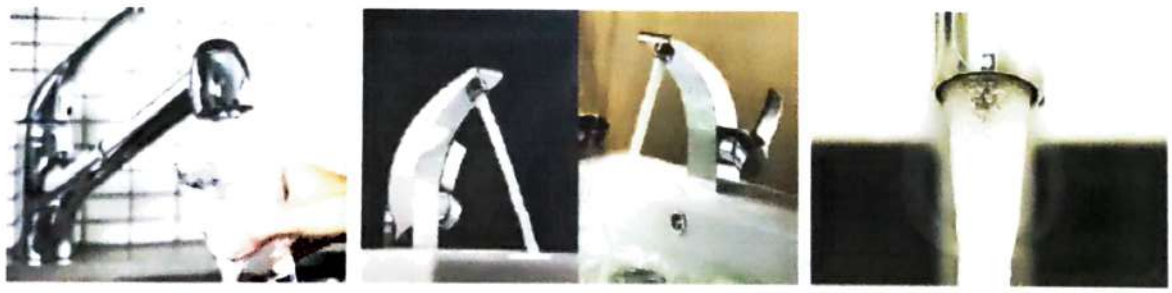
Photographs: Electronic flush urinals

Hand wash

Foam taps

Conventional taps are used in the hand wash areas which results in wastage of large quantities of fresh water. Foam taps are a better fit in these high consumption areas. They consume 25-30% less water than conventional taps.



Photographs: Foam taps

Spring loaded Push taps

Spring loaded push type tap is an alternate device for minimizing hand wash water. The spring-loaded push taps operate with the simple mechanism of pressing the knob for water. The knob is automatically released back to close position in 5-7 seconds. This saves about 30-40% of water compared to the conventional taps.



Photographs: Spring loaded push taps

Low flush cistern

The latest model closets are water efficient and operate in dual mode, with a single flush releasing 2 litres of water and the dual flush releasing 4 litres per flush. This results in excellent water savings.



Photographs: Low flush cisterns

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Install sewage treatment plant – Rootzone treatment:

VIPW uses more than 30 KL of fresh water per day. Considering 10 KL of water is being let to drain without treatment, good opportunity exists to reduce freshwater consumption by treating the sewage water and using the recycled water for gardening and flushing application. Install biogas plant and phytoremediation in series to recycle water and reduce freshwater consumption.

VIPW has already installed a biogas plant for generating biogas from canteen waste. Presently, sewage water is being let out to the drain without treatment. An opportunity exists to generate biogas from the untreated sewage water and use the generated biogas to substitute LPG used in the college.

In 2019, VIPW had used 2 MT of LPG. By generating biogas from sewage water, about 0.9 MT of LPG can be replaced which will result in carbon savings of 2.49 MT CO2e.

Biogas Production Potential of Wastewater

The sewage water is a useful waster as 1% of it in any quantity is a sludge which when subjected to anaerobic digestion will produce biogas. Wastewater is the effluent from household, commercial establishments and institutions, hospitals, industries and so on. Sewage water source contains large amount of organic material which can be efficiently recovered in as sludge which and when subjected to anaerobic digestion, the sludge produces methane gas (biogas).

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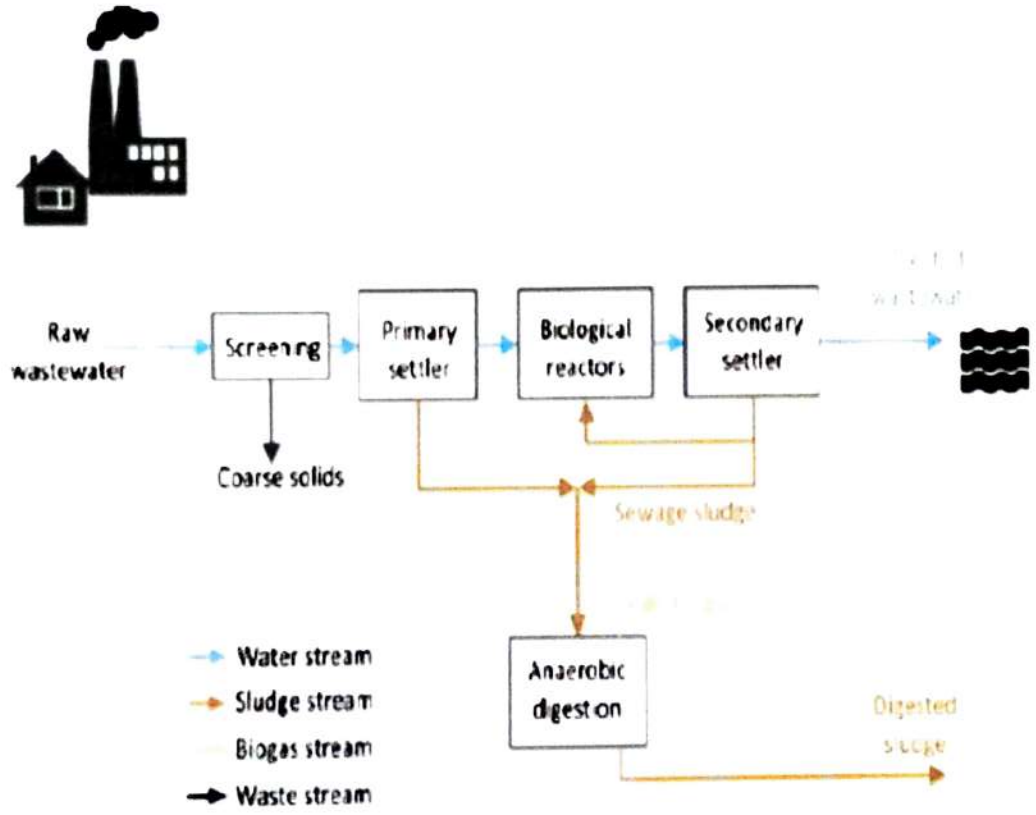
sustainable waste management and renewable energy technique. One of the major environmental problems of the world today is waste management and wastewater constitutes a huge environmental problem to the society thus the need for wastewater treatment to recover and also recycle the recovered water for usage.



The physical process: this is the mechanical treatment of the water that involves removal of debris from the raw wastewater right from the point it enters the plant. The screening and primary settling of debris. Wastewater enters the treatment plant through the inlet chamber from where it is channeled to the coarse screen that removes solid waste.

The biological process: this involve the biotreatment of the sewage in the bioreactors. It is the heart of the treatment plant where a biological process takes place. The bioreactors of a treatment plant are usually large tanks consisting of several mammoth rotors and submersible mixers. While the rotor introduces atmospheric oxygen into the sewage, the submersible mixers keep the biomass in suspension thus several reactions takes place in the bioreactors.

From the bioreactor, the sewage enters the sedimentation tank. Here the biological process ends and sludge is separated from water such that the clean water is passed to the disinfection tank for disinfection and onward discharge for use while the sludge is removed by the returned activation sludge (RAS) pump that removes and sends part to the anaerobic digestion chamber while some are return to the anaerobic bioreactor for reactivation.

Production of biogas is an anaerobic digestion whereby microorganisms break down biodegradable material in the absence of oxygen to produce methane/carbon dioxide used to generate electricity and heat. Sludge from the treatment plant (primary and activated sludge) is the main feedstock (biodegradable organic matter) in the biogas production plant of a wastewater treatment plant and the biogas production process involves series of steps. The combine sludge resulting from primary and secondary water treatment is gathered, sieved and thickened to a dry solids content of up to 7% before entering the digesters. Optionally, the sludge can be pretreated by disintegration technologies with the aim to improve the gas yield. In the anaerobic digestion process, the sludge is pumped into the anaerobic continuously stirred tank reactors where digestion takes place.

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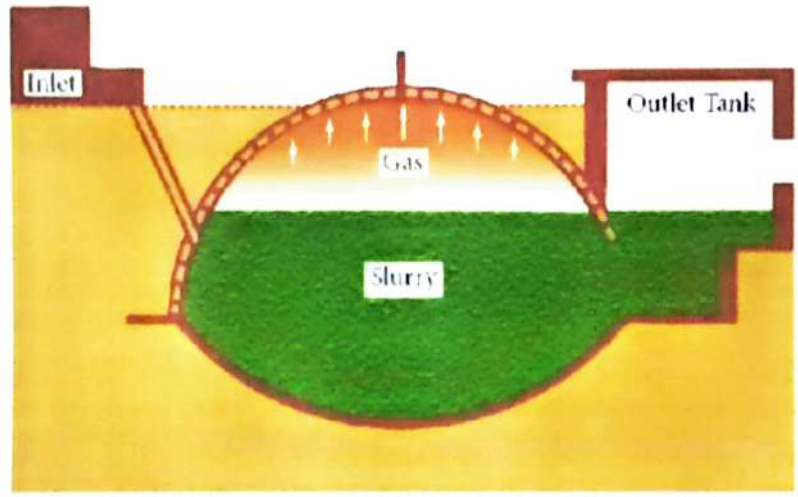
In the process, microorganisms break down part of the organic matter that is contained in the sludge and produce biogas, which is composed of methane, carbon dioxide and trace gases. The raw biogas produced is dried and hydrogen sulphide and other trace substances removed and burned in burners after treatment. The digested sludge is dewatered, and the water reintroduce into the treatment plant while the remaining undigested matter used for organic fertilizer.



Rootzone treatment:

Root Zone' is a scientific term used to cover all the biological activity among different types of microbes, the roots of plants, water soil and the sun. It consists planted filter-beds containing gravel, sand and soil. The RZWT system utilises nature's way of biologically processing domestic & industrial effluents. This effective technology called Decentralised Wastewater Systems (DEWATS) was developed in 1970s in Germany and has been successfully implemented in different countries mainly in Europe and America.

The root zone wastewater treatment system makes use of biological and physical-treatment processes to remove pollutants from wastewater. Due to its natural process, there is no need to add any input such as chemicals, mechanical pumps or external energy. This reduces both the maintenance and energy costs.

- To accomplish this, the root zone wastewater treatment undertakes the following steps:
- Pre-treatment done in a Settler – a device that separates the liquid from the solid First treatment takes place in a Anaerobic Baffled Reactor – a device with several identical chambers through which the effluent moves from top to bottom.
- Second treatment happens in an Anaerobic Filter – a device filled with a filter material (cinder), through which the effluent moves from top to bottom.
- Third treatment takes place in a Planted Gravel Filter – a structure filled with gravel material and planted with water-resistant reed plants, which provide oxygen to the passing effluent.

The Root Zone Wastewater Treatment system takes into account the natural slope of the ground, so that water flows from one device to another without any external energy input such as motor pump. Once the reed plants create an established stand, usually after the first growing season, the reed bed requires little or no maintenance. The plant foliage will soon blend naturally into the landscape, ever changing with the seasons and creating a pleasing sight as well!

Install water flow meter:

Water flow meters are vital in understating the water consumption patterns of the campus. Presently, the water consumption is calculated rather than being measured. Water flow meters gives an accurate status if water consumption in the campus and from the water consumption values, the roadmap for water conservation activities can be prepared.

Water Meters would have many advantages:

- Encourage water conservation – important given strain on water resources
- Encourage allocatively efficient distribution. People would consume to where the marginal cost = marginal utility
- In long term lower overall water consumption would reduce leading to even lower water bills.

Vijaya Institute of Pharmaceutical Sciences for Women ENDOWMENT VIJAYAWADA

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Waste Management

India has drawn world's attention with its high paced urbanization and industrialization. Over the last decade, India has emerged as the fastest growing country with rapid economic growth. A renewed focus on sustainable growth and development is imperative as India strives to maintain its high GDP growth rate in its pursuit of achieving developed country status by the year 2022. However, the flip side of higher economic growth has resulted in increased consumption of the natural resources, increased waste generation and hence ecological degradation.

Present status: VIPW has initiated waste management activities inside its facility. Separate bins have been provided for different types of wastes. Waste bins are provided throughout the campus and students are being urged to use the bins effectively.

Observation: Though the collection of waste is being done in an orderly fashion, the storage of waste needs an improvement. Presently, the wastes are segregated at the source. The collected wastes are then taken to waste storage yard. The storage of wastes in the waste storage yard needs to be improved upon.

Recommendation: The waste management yard must be maintained in a similar fashion as that of a raw material storage room. Therefore, a total revamp of the waste storage yard is to be carried out. By doing so, the quality of the materials stored in the yard will not deteriorate and can be used a raw material for a subsequent process.

Enhance awareness creation, training and capacity building

VIPW should focus on implementing sustainable waste management practices. VIPW should regularly interact with Pollution Control Board and TSDF operators to enhance knowledge on waste management. The team should also take efforts to communicate the waste management and other policies and activities to all students in the college.

Achieve zero liquid discharge status

VIPW has already invested in STP to treat and recycle water. The treated water from STP can be used to substitute freshwater by utilizing the treated water in both high end and low-end applications.

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Conclusion

Environmental sustainability is a continuous process and there is always a scope for improvement. VIPW has displayed itself as an advocate of environmental sustainability by getting environmental audit carried out. The organization has implemented several initiatives and measures to enhance efficiency and to optimize resource intensity. The journey ahead in the path towards environmental excellence has immense scope for improvement as brought out by this report.

VIPW needs to focus and work on areas efficiency levels needs to be enhanced. For example: waste management. The observations and suggestions put forth by the report would help the facility in improving its environmental performance and pave way for ecologically sustainable growth.

This report may be taken as a guide and roadmap for achieving higher performance rating in environmental stewardship. As one of the pioneers and leaders VIPW shoulder the task of further 'learning – teaching – learning' to improve, excel, and continue the innovative efforts for success of their students and associates.

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सत्यमेव जयते

Certificate

Where there is Rural Wellbeing there is Universal Prosperity

Certificate Number: MGNCRE/SAP/AP/0085

This is to certify that Vijaya Institute of Pharmaceutical Sciences for Women, Vijayawada, Andhra Pradesh is now a Recognized Swachhta Action Plan Institution. The Institution has successfully formed the Swachhta Action Plan Committee and constituted the working groups Post COVID-19 for Sanitation & Hygiene, Waste Management, Water Management, Energy Management and Greenery along with the observation of two environment related days to inculcate in faculty, students and community, the practices of Swachhta and Reduction, Reuse and Recycling of Resources.

Dr. W G Prasanna Kumar
Chairman

Mahatma Gandhi National Council of Rural Education
Department of Higher Education, Ministry of Education
Government of India